

Energy studies highlight the following key factors affecting energy efficiency achieved when ARXX ICFs are used:

- **Higher continuous R value.** R value is a measure of thermal resistance calculated as the ratio of the temperature difference across an insulator and the heat flux (heat flow per unit area) through it. The bigger the number, the better the building insulation's effectiveness. In conventional construction, the real R value of an installed wall will be the weighted average of all its components including the air gaps, namely - fiberglass batt (R13), wood studs (R-4.38 for a 2x4) air gaps (R0)^{1,4}. By comparison, R value of ARXX ICFs is constant and performs on a continuously high R22 level.
- **Reduced air infiltration.** Infiltration could be described as the unintentional introduction of outside air into a building – also known as air leakage. Besides the obvious sources of infiltration such as cracks in the building envelope or through windows and doors, infiltration occurs through insulation gaps in the wall cavity and post-construction leakage due to the movement of the wood framing. Typically, each hour, half of the air in a conventionally constructed house is exchanged for outside air which needs to be heated or cooled^{1,4}. Structures built with ARXX ICFs have an insulated concrete core which provides a tight air barrier, reducing the air infiltration and leaving you with fewer penetration sources, i.e. windows and doors, which are easy to identify and seal.
- **Added thermal mass.** A lot of heat energy is required to change the temperature of high density materials like concrete, bricks and tiles. They are said to have high thermal mass, unlike lightweight materials such as timber with a low thermal mass. Appropriate use of thermal mass throughout a building can make a big difference to heating and cooling bills, as well as the comfort level. Thermal mass acts as a thermal battery. During summer it absorbs heat, keeping the house comfortable. In winter, the same thermal mass can store the heat from the sun or heaters to release it at night, helping the home stay warm. Correct use of thermal mass can delay heat flow through the building envelope by as much as 10 to 12 hours producing a warmer house at night in winter and a cooler house during the day in summer. Structures built with ARXX ICFs have an insulated concrete core with a high thermal mass. The benefits of the high thermal mass, such as heat absorption and thermal lag, are delaying transfer of heat to inside or outside of the building. It therefore moderates indoor temperature swings and reduces the amount of heating or cooling needed^{2,3,4}.

References

1. *The ICF Effect*, by Insulating Concrete Forms Association (ICFA)
2. *Energy Comparison Concrete Homes to Wood Frame Homes*, by VanderWerf, RP119
3. *HVAC Sizing Methodology for ICF Homes*, by US Department of Housing and Urban development
4. *Energy of Single Family Home with Various Exterior Walls*, by John Gajda, CD026, PCA